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DISPOSABLE REMOTE ZERO HEADSPACE EXTRACTOR

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CONTRACTUAL ORIGIN OF THE INVENTION

The United States Government has rights in this invention pursuant to Contract No. DE-AC07-84ID12435 between the United States Department of Energy and WINCO. Bechtel BWXT Idaho, LLC is the successor contractor to WINCO.

BACKGROUND OF THE INVENTION

Zero headspace extractors are used to perform the EPA toxicity characteristic leaching procedure to analyze volatile organic compounds. Commercially available zero headspace extractors all use stainless steel cylinders which must be cleaned and o-rings that are susceptible to decomposition. The sample is in contact with the vessel, therefore the extractor must be disassembled,

cleaned and reassembled after each extraction. This increases the amount of labor required for each extraction and makes the zero head space extractor impractical for use with highly radioactive samples. These must be handled with manipulators, which are difficult to use and provides a greater opportunity for error.

5 U.S. patents 4,864,877 and 4,974,456 (both to Ortiz et al.) disclose zero headspace devices. These patents, which have related disclosures, the latter being a divisional of the former, disclose zero-headspace sampling containers intended to meet EPA sampling requirements for liquids, and not for multi phase samples, such as solvent-treated soil samples. Ortiz et al. do not disclose filtration means to retain sediment and do not disclose pressurized containers.

10 U.S. Pat. No's. 5, 470,535 and 5, 607,234 relate to extractor vessels designed for agitating a sample mixture comprising a solids-containing sample and an extraction liquid, which include a separator or filtration means through which the sample mixture can be discharged under pressure. None of the constructions of 15 these prior patents is suitable for meeting the objects of the present invention.

SUMMARY OF THE INVENTION

The instant invention is a remote zero headspace extractor. The remote zero headspace extractor uses a sampling container in combination with a pressure vessel or a stainless steel canister. In addition, it uses an in line filter for ease of

replacement. All connections are made with quick connect fittings which allows a quick and less costly replacement of all parts. After use, the sampling container can be removed and disposed of, and a new sampling container inserted for the next extraction.

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Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

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It is an object of the invention to provide a zero headspace extractor for use with highly radioactive samples.

It is another object of the invention to reduce the amount of labor necessary for each sample extraction process.

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An additional object is to provide a remote zero head space extractor having a disposable sampling container.

To achieve the foregoing and other objects and in accordance with the purpose of the present invention, as embodied and broadly described herein, the invention may comprise a sampling container inside a stainless steel container or a pressure vessel which eliminates the need for cleaning and the disassembly of the

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extractor.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and form part of the specification, illustrate an embodiment of the of the present invention and together with the description, serve to explain the principles of the invention. In the drawings:

5 Figure 1 shows an embodiment of the invention,

Figure 2 shows a detail of the filter system,

Figure 3. shows a second embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

10 Referring to Figure 1, The remote extraction system (1) consists of a sampling container (2), custom-designed with a wide mouth screw cap (3) at one end, and a quick connect fitting (4) at the other, a stainless steel pressure vessel (5), and an in-line filter (6). The stainless steel pressure vessel (5) has a screw top lid (7). The body of the pressure vessel (5) a bulkhead quick connect fitting (8) which is adapted to fit a gas line (9). The extracts are collected in the sampling container (2) consisting of a tedi¹⁵lar bag equipped with a quick connect fitting or a glass syringe having a quick-connect fitting (4) at one end and a wide mouth opening and cap (3) at the other. Eyelets (10) are provided so that may be placed on a rack (not shown) and inserted into the pressure vessel (5). The system is designed to fit into a commercially available TCLP agitators.

20 In operation, the sample and extraction fluid is introduced into the tedi¹⁵lar bag

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(2) through the wide mouth screw cap (3). The pressure vessel (5) is opened and the sealed, zero headspace tedlar bag (2) is placed inside the vessel (5) with the quick connect fitting (4) attached to the quick connect fitting (11) inside the lid (7). The lid (7) of the pressure vessel (5) is closed and sealed. The gas line (9) is attached to the quick-connect fitting (8) at the base of the pressure vessel (5) allowing the gas flow to be started. Any gas or liquid under pressure can be used to pressurize the vessel. An in-line filter (6) with a quick-connect fitting (12) is attached to the lid (7) of the pressure vessel (5). The gas flow will compress the tedlar bag (2) inside the pressure vessel (5) until liquid is seen at the fitting (11). The gas line (9) is disconnected and the quick connect fitting (12) on the downstream side of the filter (6) is removed maintaining pressure inside the pressure vessel (5).

The pressure vessel (5) is placed in a rotator and extracted for 18 hours. The pressure vessel (5) is removed from the rotator and placed upside-down on a rack. A second tedlar bag with a quick connect fitting (not shown) is attached to the fitting on the downstream side of the filter (12) and the gas line (9) attached to the fitting (8) on the side of the pressure vessel (5). Gas is introduced to generate pressure inside the vessel (5) and to compress the bag and force the extract into the second tedlar bag for collection.

As shown in figure 2, the filter (12) consists of a glass filter (13) sandwiched between two stainless steel screens (14, and 15) and inserted inside a two Teflon blocks (16, and 17). The Teflon blocks have centered bore holes (18) approximately 1/4 inch in diameter. The filter (12) is held together by two screw and nut (19, and 20) combinations.

Figure 3 shows another embodiment of the invention, the sampling container (21) is a Teflon bottle (21). The stainless steel canister (22) is equipped with a wide

mouth lid (24) that is either screwed on or acts as a flip top. The lid (24) has a quick connect fitting (25) that allows the Teflon bottle (21) has a fitting (30) to connect with upstream side of the filter (26). A second quick connect fitting (27) is attached to the down stream side of the filter (26). The canister (22) is adapted to receive a manual piston (23). A threaded opening (29) in the canister (22) is fitted with the manual piston (23), whereby as the threaded piston rod (28) is turned pressure is asserted on the Teflon bottle (21) to remove the extract from the Teflon bottle (21) into a Tedlar bag or bottle. A thread or cord can be tied around the bottle (21) so that as the piston (23) compresses the bottle(21), the bottle (21) compresses in a uniform manner.

The foregoing description of the preferred embodiment of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and obviously many modifications and variations are possible in light of the above teaching.